REMARKS

By this Second Amendment After Final Rejection, Claims 7, 12, 22-25 and 28 are cancelled, and Claims 1, 4, 8, 10, 11 and 16 are amended. These same amendments were presented in the Amendment After Final Rejection filed on September 28, 2007. **The Advisory Action indicates that these claim amendments raise new issues and denied entry of the amendments.** New Claims 31-40 are added, leaving Claims 1-5, 8-11, 13, 14, 16-21 and 29-40 pending in this application. The claim amendments do not add new matter. Favorable consideration and allowance are respectfully requested in light of the above amendments and the following remarks.

Restriction Requirement

Non-elected Claims 22-25 have been cancelled, making the restriction requirement moot.

Objections to Drawings

The drawings were objected to under 37 C.F.R. § 1.84(p)(4) for allegedly using the same reference number for several different features shown in the drawings.

Claims 1, 4, 8, 10, 11 and 16 have been amended to change the features of a "first member" to "backing plate," "second member" to "showerhead electrode" and "third member" to "top plate." Applicants submit that these amendments fully address and overcome each of the objections to the drawings. Therefore, withdrawal of the objections is respectfully requested.

Rejection Under 35 U.S.C. § 103

Claims 1-5, 7-14, 16-21 and 28-30 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,818,096 to Barnes et al. ("Barnes") in view of U.S. Patent No. 5,776,364 to Ishida et al. ("Ishida") and further in view of Japanese Publication No. 4316709 ("Nishimura"). This rejection is respectfully traversed.

Claim 1 has been amended to incorporate the features of cancelled Claim 7. Amended Claim 1 recites a component of a plasma processing apparatus comprising a graphite backing plate bonded to a silicon showerhead electrode, the backing plate including a plurality of through apertures having a first portion and a second portion wider than the first portion; and a plurality of first fastener members each mounted in an aperture of the backing plate, each first fastener member including a non-circular shaped head configured to prevent rotation of the first fastener members relative to the backing plate, the head having a bearing surface facing a surface that at least partially defines the second portion of the aperture (emphasis added).

The exemplary embodiment of the component shown in Figure 10 of this application includes an outer electrode member 14 of the showerhead electrode, and a backing ring 22 of the backing member bonded to the outer electrode member 14. The backing ring 22 includes "through" apertures 136, i.e., apertures extending through the backing ring 22. The apertures 136 have a first portion (upper portion) and a second portion (lower portion adjacent the top surface of outer electrode member 14) wider than the first portion.

For rejections under 35 U.S.C. § 103(a) based upon a combination of prior art references, the Supreme Court stated that "a patent composed of several elements

is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l v. Teleflex Inc.*, 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007). The Office must also provide articulated reasoning with rational underpinnings to support the alleged obviousness of the claimed subject matter. As stated in *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." For at least the reasons stated below, Applicants respectfully submit that the Office has not established a *prima facie* case of obviousness with respect to any one of the pending claims.

The Office asserts that Barnes discloses: a first member 1 (i.e., upper plate 1) bonded to a second member 8, 2 (i.e., outer ring 8, lower plate 2), and which includes a "plurality of through apertures (T-shaped hole for 18)" having a first portion and a second portion wider than the first portion; first fastener members 22 (i.e., bolts 22), which are "T-nuts having a T-shape (as seen in Figure 1) and internal threads" (page 5, point (i)) and comprise a rectangular-shaped head (page 5, point (iii)); and a temperature-controlled top plate 7 (i.e., lid 7) on the first member 1 (page 5, point (iv)). The Office acknowledges various deficiencies of Barnes with respect to Claim 1 at page 8, points (i) and (ii).

The Office further asserts that Nishimura discloses T-nuts 10 having a T-shape. (Page 12, next-to-last paragraph.)

Regarding Ishida, the Office further asserts:

> Ishida teaches a similarly constructed plasma apparatus (Figure 1) and electrode (106; Figure 1, 3-5) including a plurality of <u>first</u>

> fastener members (109; Figures 3-4) with a first portion (Top of 109) being wider in transverse direction than a second portion (Bottom of 109). Ishida's first fastener members (109; Figures 3-4) each include a head (top thickest portion of 109; Figure 1) bonded[1] with an elastomer (31a - "O-rings"; Figure 3; column 4, lines 23-28). (Emphasis added.) (Page 12, next-to-last paragraph.)

The Office asserts that it would have been obvious to add Nishimura's T-nuts to Barnes' structure for "stably seating" apparatus parts and transferring heat among "Ishida's component parts," and to add Ishida's first fastener members 109 "bonded with an elastomer" to Barnes' apparatus. Applicants respectfully disagree with these assertions.

In the electrode shown in Figure 1 of Barnes, the upper plate 1 is axially spaced from the lower plate 2 by a gas chamber 9. Pins 4 extend through the lower plate 2 and into the upper plate 1, and function to support the upper plate 1 on the lower plate 2 such that plenum chamber 9 is defined between the plates 1, 2. Despite the upper plate 1 being separated from the lower plate 2 by the plenum chamber 9, the Office asserts that the upper plate 1 is "bonded" to the lower plate 2 and outer ring 8. However, Barnes discloses that "upper plate 1 and lower plate 2 are connected by pins or studs 4." Barnes does not disclose or suggest that the upper and lower plates 1, 2 are "bonded" to each other.

Barnes' lower plate 2 is made of aluminum or other electrically conductive materials (column 2, lines 9-13), while the outer ring 8 surrounding the lower plate 2 consists of an insulator material (column 2, lines 16-17). As such, the lower plate 2 and outer ring 8 are not a silicon showerhead electrode, as recited in Claim 1. Nor has the Office articulated a reason to make Barnes' outer ring 8 from an electrically

conductive material, instead of from an electrical insulator material, much less to make Barnes' lower plate 2 and outer ring 8 both of silicon.

Barnes' upper plate 1 also does not include "a plurality of through apertures having a first portion and a second portion wider than the first portion" (emphasis added), as recited in Claim 1. To the contrary, Barnes' "T-shaped hole for 18" shown in Figure 1 includes a wider portion formed in the lid 7, adjacent the top surface of the lid 7.

The Office has also not established that Barnes' bolts 22 necessarily have a rectangular-shaped head, or any other non-circular shape, based on the structure of the bolts 22 shown in Figure 1 of Barnes. In fact, the cross-sectional shape of the bolts 22 shown in Figure 1 of Barnes is completely consistent with the bolts 22 having a circular-shaped head. Barnes also does not include an explicit disclosure supporting the allegation that the bolts 22 have a non-circular shaped head.

To the extent that the Office contends that Barnes' bolts 22 inherently have a non-circular shape, it is well established that "[i]nherency ... may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999) (citations omitted). The Office has not established that the bolts 22 must have a non-circular shape and thus has not established such inherency.

Moreover, the Office has not articulated a reason why one skilled in the art would combine the teachings of Barnes, Ishida and Nishimura to result in the component recited in Claim 1. Regarding Ishida, Figure 2 shows a heat conductor 109 in the form of a plate or grid comprising rectangular gas pressure equalizing

spaces 109a defined between frame 109b and crossing bars 109c. Threaded holes 33a are formed in the crossing bars 109c, and O-rings 31a are placed in the threaded holes 33a. First bolts 30a are inserted in the threaded holes 33a to attach the heat conductor 109 to the temperature controlling plate 106

Figure 3 of Ishida shows a cross-section through the heat conductor 109 taken at the location of a threaded hole 33a. As shown, a first bolt 30a is threaded into a threaded hole (i.e., threaded hole 33a shown in Figure 2) in the heat conductor 109. The O-ring 31a is seated in a groove formed in the heat conductor 109 facing the gas ejector plate 105. Gas pressure equalizing space 109a surrounds the heat conductor 109. A gas passage 109d is defined between the heat conductor 109 and the top surface of the gas ejector plate 105.

Figure 4 of Ishida shows a cross-section through the heat conductor 109 at the location of a hole 32b formed in the heat conductor 109 (see Figure 2). As shown in Figure 4, a second bolt 30b is inserted in a threaded hole (i.e., threaded hole 32b shown in Figure 2) in the heat conductor 109. Gas pressure equalizing space 109a surrounds the heat conductor 109.

Applicants submit that the portions of the heat conductor 109 shown in Figures 3 and 4 of Ishida are an integral part of the heat conductor 109 depicted in Figure 2. Ishida does not disclose or suggest that the portions of Ishida's heat conductor 109 shown in Figures 3 and 4 are "first fastener members" each mounted in an aperture of a first member and including a non-circular shaped head configured to prevent rotation of the first fastener member relative to a backing plate, as recited in Claim 1.

In light of at least these deficiencies of Ishida with respect to the component recited in Claim 1, the Office has not articulated a reason to modify Barnes' electrode in view of Ishida such: that Barnes' lower plate 2 and outer ring 8 are both made of silicon; Barnes' upper plate 1 includes "a plurality of through apertures having a first portion and a second portion wider than the first portion" (emphasis added); or Barnes' electrode includes "a plurality of first fastener members each mounted in an aperture of the backing plate, each first fastener member including a non-circular shaped head configured to prevent rotation of the first fastener members relative to the backing plate, the head having a bearing surface facing a surface that at least partially defines the second portion of the aperture" (emphasis added), as recited in Claim 1.

Nishimura is unrelated to a component of a plasma processing apparatus. Nishimura discloses a T-slot nut 10 shown in Figure 1. Applicants submit that the Office has also not articulated a reason to modify Barnes' structure in view of Nishimura to result in the component recited in Claim 1. For example, Nishimura also does not provide a reason to bond Barnes' upper plate 1 to the lower plate 2 instead of connecting these plates together with the electrically conductive pins 4. The Office has not provided a reason to eliminate the pins 4 and, consequently, the plenum chamber 9 formed with the pins 4.

Nishimura also does not provide a reason to modify Barnes' structure such that Barnes' lower plate 2 and outer ring 8 (i.e., alleged "second member") are both made of silicon. Nishimura is unrelated to a silicon showerhead electrode.

In the paragraph bridging pages 15 to 16 of the Official Action, the Office contends that Nishimura's T-nuts 10 and Ishida's "first fastener members" 109 are

"mechanical equivalents for secure [sic] mechanical elements/components together." As discussed above, however, in Ishida' structure, element 109 is a heat conductor plate with multiple gas equalizing spaces 109a defined between crossing bars 109c and frame 109b. The heat conductor plate 109 cannot properly be considered to be "a plurality of first fastener members," as recited in Claim 1. Clearly, Nishimura's T-slot nut 10 is not a mechanical equivalent to Ishida's heat conductor plate 109, as alleged by the Office.

As such, Nishimura also does not provide a reason to modify Barnes' upper plate 1 to include "a plurality of through apertures having a first portion and a second portion wider than the first portion" (emphasis added), or to include "a plurality of first fastener members each mounted in an aperture of the backing plate, each first fastener member including a non-circular shaped head configured to prevent rotation of the first fastener members relative to the backing plate, the head having a bearing surface facing a surface that at least partially defines the second portion of the aperture" (emphasis added), as recited in Claim 1.

Thus, for at least these reasons, the component recited in Claim 1 is patentable over the applied combination of references. Claims 2-5, 8 and 9, which depend from Claim 1, are also patentable over the applied references for at least the same reasons as those for which Claim 1 is patentable.

Moreover, Claims 2-5, 8 and 9 recite additional combinations of features that are not disclosed or suggested by the applied combination of references. For example, Claim 3 recites the features of "the surface that at least partially defines the second portion of the aperture is a second bearing surface and the bearing surface of each of the first fastener members is bonded with an elastomer to the second

bearing surface." The Office has not established a factual basis to support the assertion that the portions of the heat conductor 109 shown in Figures 3 and 4 of Ishida include a head "bonded" with any material, much less with an elastomer. As shown in Figure 3 of Ishida, the heat conductor 109 is fastened to the temperature controlling plate 106 by a first bolt 30a. The O-ring 31a functions to form an airtight seal (column 4, lines 36-37). The Office has not established that the O-ring causes the heat conductor 109 to "adhere firmly" to the temperature controlling plate 106. As such, Ishida does not disclose or suggest such first fastener members bonded with an elastomer to a second bearing surface partially defining a portion of an aperture. Nishimura also does not disclose or suggest the features of Claim 3.

As another example, Claim 8 recites the features of "the showerhead electrode comprises an inner silicon electrode and a segmented outer silicon electrode, and the graphite backing plate is secured to the inner silicon electrode and a graphite backing ring is secured to the outer silicon electrode" (emphasis added). Barnes' electrode structure does not include a showerhead electrode with an inner electrode and segmented outer electrode, much less a silicon showerhead electrode with these features. Barnes' electrode structure also does not include a backing ring secured to an outer electrode. Ishida and Nishimura also do not disclose or suggest the features of Claim 8. For example, in Ishida's upper electrode assembly, the gas ejector plate 105 is surrounded by an insulator 105c (column 3, line 29). Nishimura is unrelated to a showerhead electrode. As such, the Office has not articulated a reason why one skilled in the art would combine the teachings of Barnes, Ishida and Nishimura to result in a component comprising, *inter alia*, a showerhead electrode as recited in Claim 8.

Independent Claim 10 has been amended to incorporate the features of cancelled Claim 12. Amended Claim 10 recites a component of a plasma processing apparatus comprising a showerhead electrode including an attachment surface and an exposed surface adapted to be exposed to an interior of a plasma processing chamber; a backing plate including a first surface spaced from a second surface, the first surface contacting and being bonded to the attachment surface of the showerhead electrode, the backing member including axially extending apertures extending between the first surface and the second surface, each of the apertures including a first portion opening in the first surface and a second portion opening in the second surface, the first portion being wider in a transverse direction than the second portion; and T-nuts having a T-shape located in the second portions of the apertures (emphasis added).

At point (vi) bridging pages 6 to 7 of the Official Action, the Office asserts that Barnes discloses a second member 3 (i.e., protective plate 3), including an "attachment surface" "2/3 interface" (i.e., interface between lower plate 2 and protective plate 3) and an "exposed surface" (lowest surface of protective plate 3), and that lowest surface of lower plate 2 is bonded to the attachment surface.

In Claim 10, the "second member" has been changed to the "showerhead electrode." Barnes' "second member" 3, i.e., protective plate 3, is not a showerhead electrode. The Office appears to acknowledge that Barnes' protective plate 3 is not a showerhead electrode at page 10, point (x), with respect to cancelled Claim 12. In stark contrast, the protective plate 3 is made of a dielectric material (column 2, lines 14-16). Accordingly, because Barnes' protective plate 3 is not an electrical conductor, but is a dielectric plate, Barnes would have led one having ordinary skill in

the art away from modifying the protective plate 3 to result in a showerhead electrode having a surface adapted to be exposed to an interior of a plasma processing chamber.

The Office has also not articulated a reason why either of Ishida or Nishimura provides any reason to modify Barnes to result in the component comprising a showerhead electrode as recited in Claim 10.

Applicants submit that the Office has also not articulated a reason to modify Barnes' lower plate 2 to include a "backing member including axially extending apertures extending between the first surface and the second surface, each of the apertures including a first portion opening in the first surface and a second portion opening in the second surface, the first portion being wider in a transverse direction than the second portion; and T-nuts having a T-shape located in the second portions of the apertures." In Barnes' electrode, the protective plate 3 is bonded to the lower plate 2, and the lower plate 2, in turn, is connected to and spaced from the upper plate 1 by pins 4 to define the plenum chamber 9 between the plates 1, 2. As such, the Office has not articulated any reason why one skilled in the art would have modified Barnes' lower plate 2 to include the apertures and T-nuts located in the apertures, as recited in Claim 10.

Thus, the component recited in Claim 10 is patentable over the applied combination of references. Claims 11, 13, 14, 16 and 28, which depend from Claim 10, are also patentable for at least the same reasons as those for which Claim 10 is patentable.

Moreover, Claims 11, 13, 14, 16 and 28 recite additional combinations of features that are not suggested by the applied combination of references. For

example, Claim 11 recites the features of "a temperature-controlled top plate adjacent the second surface of the backing plate and including through openings aligned with the apertures in the backing plate; and connectors located in the openings, the connectors being detachably engaged with the T-nuts such that the top plate is detachable from the backing plate" (emphasis added). In contrast, in Barnes' electrode structure, the lower plate 2 is adjacent upper plate 1 and the plates 1, 2 define the plenum chamber 9 between them. The upper plate 1 is not a temperature-controlled top plate. Instead, Barnes discloses a temperature-controlled lid 7 provided on the upper plate 1, as shown in Figure 1. As such, the Office has not articulated a reason to modify Barnes' electrode structure to include the features recited in Claim 11.

Independent Claim 17 recites, *inter alia*, a showerhead electrode assembly for a plasma processing apparatus comprising a silicon showerhead electrode having gas injection openings and a plasma exposed surface; a graphite backing member secured to the silicon showerhead electrode, the backing member including a plurality of through apertures each having a first portion and a second portion wider than the first portion; a top plate including a plurality of through openings each of which is aligned with a respective aperture in the backing member; and a plurality of T-nuts having a T-shape, each T-nut being mounted in a respective aperture of the backing member, each T-nut including a bearing surface facing a surface at least partially defining the second portion of the apertures (emphasis added).

The Office asserts that Barnes discloses an electrode 7. (Official Action at page 7, point (vii)). However, the element 7 is a lid including cooling channels 20 to provide cooling in the electrode. Barnes further discloses that the lid 7 is made of an

electrical conductor, such as aluminum, and not of silicon. The Office has not articulated any reason to make the lid 7 of silicon, or to have a plasma exposed surface.

The Office further asserts that Barnes' electrode 7 includes "gas injection openings" 5 (i.e., insert 5). In Barnes' electrode, protective plate 3 and lower plate 2 include holes 24, 25 through which gas is distributed. The bottom surface of protective plate 3 is plasma exposed. As discussed above, the protective plate 3 is a dielectric plate and, as such, is not a showerhead electrode. The Office has not articulated a reason to modify Barnes' dielectric protective plate 3 to make the plate of silicon.

The Office also takes the position that Barnes' lid 7 is a top plate (point (vii), line 9). Applicants submit that one skilled in the art would understand that the lid 7 cannot be both a showerhead electrode and a top plate in Barnes' electrode.

Applicants submit that Ishida and Nishimura fail to provide any reason to modify Barnes' electrode to result in the showerhead electrode assembly recited in Claim 17. Thus, the showerhead electrode assembly recited in Claim 17 is patentable over the applied combination of references.

Claims 18-21, 29 and 30, which depend from Claim 17, are also patentable for at least the same reasons as those for which Claim 17 is patentable. Moreover, these dependent claims recite additional combinations of features that are not suggested by the applied combination of references. For example, Claim 20 recites the features of "the silicon showerhead electrode comprises an inner member and a segmented outer member, and the backing member comprises a backing plate secured to the inner member and a backing ring secured to the outer member"

(emphasis added). As discussed above, the combination of Barnes, Ishida and Nishimura does not suggest the showerhead electrode assembly recited in Claim 20.

Therefore, withdrawal of the rejection is respectfully requested.

New Claims

New Claims 31-33 depend from Claim 1, Claims 34-36 depend from Claim 10, and Claims 37-39 depend from Claim 17. New Claim 40 is independent. Claims 31-40 are also patentable.

Conclusion

For the foregoing reasons, allowance of the application is respectfully requested. If there are any questions concerning this response, the Examiner is respectfully requested to contact the undersigned at the number given below.

Respectfully submitted,

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